

### WHAT IS CLAIMED IS:

1. An isolated polynucleotide that encodes a human  $\beta$ 1A sodium channel subunit protein, said polynucleotide comprising a member selected from a group consisting of:
  - (a) a polynucleotide having at least a 75% identity to a polynucleotide encoding a polypeptide consisting of amino acids 1 to 268 of SEQ.ID.NO.:14;
  - (b) a polynucleotide having at least 75% identity to a polynucleotide encoding a polypeptide consisting of amino acids 150 to 268 of SEQ.ID.NO.:14;
  - (c) a polynucleotide which is complementary to the polynucleotide of (a) or (b); and
  - (d) a polynucleotide comprising at least 15 sequential bases of the polynucleotide of (a), (b), or (c).
2. The polynucleotide of claim 1 wherein the polynucleotide is RNA.
3. The polynucleotide of claim 1 wherein the polynucleotide is DNA.
4. The polynucleotide of claim 1, having a nucleotide sequence selected from a group consisting of: (SEQ.ID.NO.:12) and (SEQ.ID.NO.:13)
5. The polynucleotide of claim 4 further consisting of allelic variants, mutants, and functional derivatives (SEQ.ID.NO.:12) and (SEQ.ID.NO.:13).
6. The polynucleotide of claim 1, wherein said DNA molecule is genomic DNA.
7. An expression vector for expression of a human  $\beta$ 1A sodium channel subunit protein in a recombinant host, wherein said vector contains a recombinant

gene encoding a human  $\beta$ 1A sodium channel subunit protein and functional derivatives thereof.

8. The expression vector of claim 7, wherein the expression vector contains a cloned gene encoding a Human  $\beta$ 1A sodium channel subunit protein, having a nucleotide sequence selected from a group consisting of: (SEQ.ID.NO.:12) and (SEQ.ID.NO.:13).

9. The expression vector of claim 8, wherein the group further consists of allelic variants, mutants, and functional derivatives of SEQ.ID.NO.:12 and SEQ.ID.NO.:13.

10. The expression vector of claim 7, wherein the expression vector contains genomic DNA encoding a Human  $\beta$ 1A sodium channel subunit protein.

11. A recombinant host cell containing a recombinantly cloned gene encoding Human  $\beta$ 1A sodium channel subunit protein or a functional derivative thereof.

12. The recombinant host cell of claim 11, wherein said gene has a nucleotide sequence selected from a group consisting of: (SEQ.ID.NO.:12); (SEQ.ID.NO.:13); and functional derivatives thereof.

13. The recombinant host cell of claim 11, wherein said cloned gene is genomic DNA.

14. An isolated protein encoded by a nucleic acid sequence capable of hybridizing under stringent hybridization conditions to a nucleotide sequence having the sequence of SEQ ID NO:12 or SEQ ID NO:13 that when combined

with a Human  $\alpha$  sodium channel subunit protein in a cell permits sodium ion flux in the cell.

15. The protein according to claim 14, having an amino acid sequence selected from a group consisting of: (SEQ.ID.NO.:14) and functional derivatives thereof.

16. A monospecific antibody immunologically reactive with a human  $\beta$ 1A sodium channel subunit protein.

17. A process for expression of a Human  $\beta$ 1A sodium channel subunit protein in a recombinant host cell, comprising:

- (a) introducing an expression vector comprising a nucleic acid sequence capable of hybridizing under stringent hybridization conditions to a nucleotide sequence, or its complementary sequence, having the sequence of SEQ ID NO:12 or SEQ ID NO:13 into a cell;
- (b) culturing the cell of step (a) under conditions which allow expression of a protein encoded by the nucleotide sequence.

18. A method of screening for a modulator of sodium channel activity comprising:

- (a) providing a cell that co-expresses a protein encoded by a nucleic acid capable of hybridizing under stringent hybridization conditions to a nucleotide sequence, or its complementary sequence, represented by SEQ ID NO:12 or SEQ ID NO:13 and a sodium channel  $\alpha$  subunit protein wherein the cell elicits a sodium ion flux;
- (b) contacting the cell with a putative  $\beta$ 1A modulating compound; and
- (c) measuring a change upon the cell that alters the sodium ion flux.

19. The method of claim 18 wherein at least one of the proteins is a recombinant protein.

20. The method of claim 18 wherein the change in sodium ion flux is selected from a group consisting of:

- (a) increasing the capacity to open the Na channel;
- (b) decreasing the capacity to open the Na channel;
- (c) increasing the rate of desensitization;
- (d) decreasing the rate of desensitization ;
- (e) increasing the rate of re-sensitization of the channel;
- (f) decreasing the rate of re-sensitization of the channel;
- (g) increasing the level of  $\beta 1A$  protein expression;
- (h) decreasing the level of  $\beta 1A$  protein expression;
- (i) increasing the level of the  $\alpha/\beta 1A$  complex protein expression; and
- (j) decreasing the level of the  $\alpha/\beta 1A$  complex protein expression.

21. A compound that modulates the function of human  $\beta 1A$  selected using the method of claim 18.

22. A pharmaceutical composition comprising a compound of claim 19.

23. A method of treating neuropathic pain in a patient in need of such treatment comprising administration of a modulating compound of Claim 21.

24. A method of treating neuropathic pain in a patient in need of such treatment comprising altering the level of a human  $\beta 1A$  subunit in a dorsal root ganglia cell in the patient.

25. A method of treating chronic pain in a patient in need of such treatment comprising administering the compound of Claim 21.

26. A method of treating febrile seizures in a patient in need of such treatment comprising administering the compound of Claim 21.

27. A method of treating general epilepsy in a patient in need of such treatment comprising administering the compound of Claim 21.

28. An anticonvulsant pharmaceutical composition comprising a compound of claim 21.

29. A method of treating arrhythmia in a patient in need of such treatment comprising administering the compound of Claim 21.

30. 31. A pharmaceutical composition comprising a compound of claim useful for use as a local anesthetic.

31. 32. A method for decreasing neuropathic pain in an individual comprising administering to said individual a modulator of a sodium channel  $\beta 1A$  subunit in an amount effective to change the sodium channel activity in said individual.

32. 33. The method of claim 31 wherein said modulator decreases the expression of sodium channel  $\beta 1A$  subunit in the cells of said individual.

33. 34. A method for treating neuropathic pain in a subject comprising altering the level of sodium channel  $\beta 1A$  subunits on the surface of a cell in a subject.

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35. A method for decreasing neuropathic pain in a human comprising the step of administering a sodium channel  $\beta 1A$  subunit-binding molecule to a sodium channel  $\beta 1A$  subunit-expressing cell in the human.

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